SCIENTIFIC LETTER

Increased prevalence of migraine in adult congenital heart disease

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Right-to-left shunt might have a relationship with migraine. The transition of vasoactive substances or microemboli seems to be the most assumed link between migraine and a right-to-left shunt.[1] This hypothesis is enforced by the observation that percutaneous closure of patent foramen ovale is associated with a significant decrease in prevalence or severity of migraine attacks.[2] In addition, other studies focused on haemoglobin levels and showed a positive relationship between frequency of migraine attacks and rising haemoglobin levels.[3] Finally, the endothelium and its interaction with the surrounding tissue and blood compounds seem to play an important role in the current trigeminovascular theory of the pathogenesis of migraine,[4] and new insights on the connection between endothelial genes and migraine are emerging.

We investigated the prevalence of migraine in patients with congenital heart disease with or without an obligate right-to-left shunt. All patients >16 years with an obligate right-to-left shunt, without Down's syndrome or mental retardation, were selected from the database of congenital heart disease (group 1). On the basis of this selection, two age- and sex-matched control groups were generated: one from the entire database of congenital heart disease (group 2) and the other from a general practice (group 3). For every patient with an obligate right-to-left shunt, 2–4 possible matches were selected from groups 2 and 3. The first responders of each match were included. All patients received a questionnaire so that a neurologist could diagnose migraine with or without aura (MA+ and MA−) according to the criteria of the International Headache Society. Besides demographic characteristics, we included for analysis haemoglobin and haematocrit levels.

A total of 40 patients were included in each group. The response rate for group 1 amounted to 78.4%, for group 2 to 74% and for group 3 to 54%. The 1-year prevalence of migraine was 35% for MA− and 5% for MA+ in the general practice (absolute numbers 14 and 2, respectively), 20% for MA− and 32.5% for MA+ in the group with random congenital heart disease (absolute numbers 8 and 13, respectively), and 25% for MA− and 40% for MA+ in the group with obligate right-to-left shunt (absolute numbers 16 and 10, respectively). The prevalence of MA+ in groups 1 and 2 was significantly higher than that in group 3 ($\chi^2 = 0.001$, $p = 0.001$, for both). The difference of the prevalence of MA+ between groups 1 and 2 was not statistically significant. No significant interobserver variability ($\kappa = 0.8$, $p = 0.001$) was observed. In a stepwise logistic regression, sex and haemoglobin levels could be identified as predictors for migraine in general ($p = 0.005$ and $p = 0.007$, $r^2 = 0.15$). In addition, the type of patient (congenital heart defect or not) and haemoglobin levels determined the presence of MA+ ($p = 0.009$ and $p = 0.036$, $r^2 = 0.24$). Sex tended to be a predictor for MA+ alone, but did not reach significance ($p = 0.113$). Table 1 summarises migraine characteristics and haemoglobin levels.

We found a significantly higher prevalence of MA+ in patients with congenital heart disease, not only with but also without an obligate right-to-left shunt, when compared with the prevalence in the general population. Until now, the assumed link between migraine and congenital heart disease concentrated almost only on right-to-left shunting and the hypothesis of vasoactive agents entering the systemic circulation without being filtered in the lung vessels.[1 2] However, the data of our study suggest that, besides a right-to-left shunt, the presence of a random congenital heart defect was also a significant determinant for the increased prevalence of MA+. These data agree with previous findings that a dominant inheritance of a predisposition to cardiac abnormalities, which were not limited to patent foramen ovale, atrial septal defect or other right-to-left shunts, was associated with the occurrence of migraine.[5] In addition, we confirmed the association between migraine and rising haematocrit levels. Migraine, due to augmented haemoglobin levels, might be caused by the activation of blood compounds and the endothelium due to shear stress. Therefore, hyperviscosity could be another explanation (besides the hypothesis of vasoactive substances)

Abbreviations: MA−, migraine without aura; MA+, migraine with aura

Table 1 Demographic data, haemoglobin levels and migraine characteristics

	Group 1	Group 2	Group 3	p Value
All patients				
Median (SD) age, years	34 (11)	34 (11)	34 (11)	1
Female/male, %	65/35	65/35	65/35	1
Mean (SD) haemoglobin level, g/dl	18.9 (2.3)	13.5 (1.7)	14.5 (1.4)	<0.001*
Patients with migraine				
Median (range) frequency score	2 (1–6)	2 (1–6)	2 (1–5)	0.218†
Median (range) duration, min	90 (30–7200)	120 (60–4320)	60 (30–4320)	0.108†
Median (range) severity score	6 (2.5–8)	7.5 (2.5–10)	5.5 (2–10)	0.106†

*Analysis of variance testing; †Kruskal–Wallis testing.
Frequency score: 1, once a month; 2, more than once a month; 3, once a week; 4, more than once a week; 5, once a day; 6, more than once a day.
Severity score expressed on a scale from 0 to 10, with 10 the most severe pain.

for the highest prevalence of MA+ in patients with congenital heart disease and an obligate right-to-left shunt, which resulted in secondary polyglobulia.

However, we have to take into account that our data are based on a small population of a single centre and that both selection and recall bias might be present.

We can conclude that the aetiology of migraine remains an enigma; however, we would like to emphasise that the origin, as well as the facilitating factors, of attacks is multifactorial.

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IMAGES IN CARDIOLOGY

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Aberrant origin of the left coronary artery from the right-facing sinus of Valsalva with intramural course: preoperative and postoperative imaging

A 15-year-old boy experienced sudden shortness of breath during physical activity (European soccer game). On admission to hospital, he presented with pulmonary oedema, monomorphic premature ventricular contractions and signs of an anterolateral myocardial infarction on the electrocardiogram. Troponin I was elevated to 56.5 ng/l. Treatment with lidocaine, furosemide and isosorbide dinitrate led to rapid resolution of symptoms. Transthoracic echocardiography showed an aberrant origin of the left anterior descending (LAD) coronary artery from the right-facing sinus of Valsalva (panel A). This finding was confirmed by a gadolinum-enhanced magnetic resonance imaging study (panel B). A myocardial technetium scan showed a small perfusion defect near the apex of the left ventricle. The LAD coursed intramurally between the two major arteries. Surgical treatment consisted of unroofing of the LAD to the left sinus of Valsalva. An electrophysiological study was performed 2 weeks after the operation to exclude inducible life-threatening ventricular tachycardia. Postoperative magnetic resonance imaging showed an unobstructed origin of the LAD from the left facing sinus from Valsalva (panel C). In summary, transthoracic echocardiography can accurately depict this rare anomaly and hence is the ideal screening tool. In patients with symptoms treatment is warranted.

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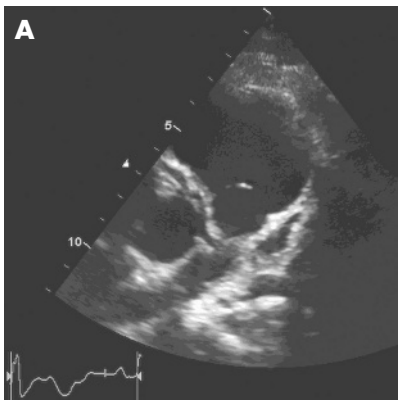
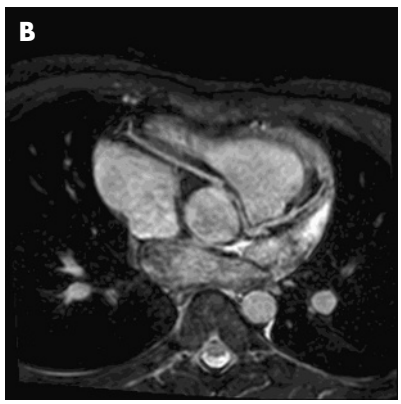
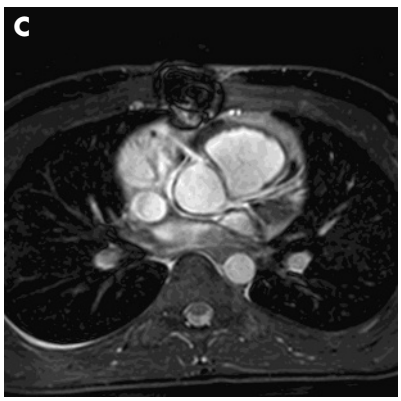


Transthoracic echocardiogram of a 15-year-old boy with aberrant origin of the left coronary artery with intramural course.



Gadolinum-enhanced magnetic resonance image depiction of the anomaly previous to surgery. The left anterior descending coronary artery has an abnormal intramural course between the aorta and pulmonary artery.



After surgical unroofing, the left anterior descending coronary artery originates without potential obstruction from the left facing sinus of Valsalva.